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CHINESE COMMUNIST COAL MINING CONTINUES TECHNICAL ADVANCE

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## FOREWORD

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CHINESE COMMUNIST COAL MINING CONTINUES TECHNICAL ADVANCE

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## I. STRENGTHEN COAL WASHING WORK, RAISE COKING COAL QUALITY

[Following is a translation of excerpts of an article by the Coal Preparation Division, Production Bureau, Ministry of Coal Industry, in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 22, 19 November 1958, pages 3-4.]

The steel drive promoted the rapid development of the coal industry. How to meet the coal needs of the iron and steel industry became an important mission of the coal industry. For this reason, the Ministry of Coal Industry suggested the slogan of "soldier against soldier and general against general" so that large-scale coal mines provided the needs of the large steel enterprises and widely dispersed small coal pits provided the needs of the native blast furnaces. To relieve the present coal shortage, it is not only necessary to raise coal production but also necessary to make savings on coal consumption.

Many problems exist in coal utilization. Many native blast furnaces require three tons of coke to make one ton of pig iron or the equivalent of 5-6 tons of mine-run coal (in some operations 8-10 tons of coal are needed). Among the reasons for high coal consumption are unfamiliarity with operations, low grade of the iron ore used, and the high ash content of the coke. The coking coal supplied to large blast furnaces has all been washed and its ash content is generally 9-10%. On the other hand, the coking coal used by small native blastfurnaces is predominantly mine-run coal which contains 20-25% ash.

According to data on large blast furnaces, for every one percent increase of the ash content of the coke, the rate of production in the blast furnaces drops by 2-2.5% (in other words, each ton of pig iron would require 2.-2.5% more coke).

By using simple methods to eliminate high-ash waste rock and shaly high-ash coal, the ash content of the coking coal can be reduced to 12-15%; this is both possible and necessary. Let us examine the ash problem of coke, according to experience with large blast furnaces. The results of washing mine-run coal are as follows:

	Production %	Ash	Output (metric tons)
Mine-run coal	100	23.0	90
After washing:			
Cleaned coal	65	12.0	58.5
Middling coal	25	35.0	22.5
Coaly waste rock	10	65.0	9.0

If 100 metric tons of mine-run coal were used to make coke, it is possible to get 60 tons of coke containing 38.3% ash. Since 3 tons of this coke are needed to make one ton of pig iron, 100 tons of mine-run coal would be needed to produce 20 tons of pig iron.

If the same 100 tons of mine-run coal were washed into clean coal and then made into coke, it is possible to get 39 tons of coke analyzing 20% ash.

Calculating on the basis of 2.3% savings in coke for every one percent reduction in the ash content of the coke, then through lowering the ash content by 18.3% (38.3% minus 20%) total coke savings would amount to 41.7%. When mine-run coal converted coke is used, 20 tons of pig iron requires 60 tons of coke; when cleaned coal converted coke is used, only  $60 \times (100 - 41.7)$  or 35 tons (equivalent to 58.5 tons of clean coal) are needed. The pig iron to coke ratio is 1:1.75.

The above analysis shows that, through coal washing, 10 tons of mine-run coal can be saved for every 100 tons as compared with using mine-run coal directly; in addition, 22.5 tons of middling coal are produced, which can be used to generate power or as fuel for civilian use. Great savings can be made on a nationwide scale if more coal washing is done.

Furthermore, coal washing cuts down the weight of coal (impurities are removed from the mine-run coal) so that less coal needs to be transported.

This should help to ease the country's "tense situation" in transport.

## II. CHANGE SMALL COKE OVENS TO LARGE COKE OVENS

[Following is a translation of an article by the Yung-ch'uan Coal Mine Coke Plant in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 22, 19 November 1958, page 14.]

Our plant is located in a hilly area, with the east facing water ditches and farms, the west and the south mountains, and the north the Yung-ch'uan Mine at a distance of 500 meters. Behind the mine are also mountains, where some workmen's houses and dormitories are built. Because the plant site land area is small, expansion of coke production is very difficult. The workmen and staff of the plant, under the guidance of the Party and with the objective of overcoming this difficulty, investigated the problem of converting small coke ovens into large ones. Success was achieved after several trials, and facilities were brought into production during the middle and last ten days of September.

The advantages of the large coke oven method are as follows:

1. The consolidation of two small coke ovens into a large oven means that the manway between the two ovens can be eliminated. The central kiln wall in the original two small coke ovens was torn down. Oil channels were built inside and the loading and unloading passageway was built in the center of the oven with light rails installed to facilitate the loading of coal and the unloading of coke. The width was changed from three to ten meters, the length was not changed (still 30 meters), the height is one meter, and the capacity was raised from the original 70 metric tons per furnace to a total of 210-220 tons (capacity is for the coal charged). Thus, converting small ovens to large ovens is cheaper than constructing new small ovens by 66,000 Yuan in investment; the change will become the determining factor as to whether or not this year's coke production quota will be attained. For each furnace, 50 kilograms of wood and 300 kilograms of coal for fuel can be saved along with varying quantities of silica brick, ties, rail, spikes, fish plates, and furnace grate, etc.
2. With regard to efficiency, the original small oven required "road connecting" three times as compared with twice for the new large ovens so that one stage of work is cut down. On the basis that one large oven is equivalent to three small ovens, one stage of work is also cut with regard to warming up the ovens because each of the original small ovens must be bottom-heated once whereas a large oven can be heated on both sides at one time.

3. With regard to the rate of coke formation and product quality, large ovens permit larger lumps of coke and greater mechanization. The small oven is narrow and has many dead corners so as to develop "suffocation"; the large oven seldom has this trouble. The large oven needs two rows less of chimneys than the small furnace, oven gates are reduced from 54 to 36, and contact with air is reduced so that the rate of coke formation is raised.

A statistical comparison between the large and small coke ovens is given in the table below:

	Small oven	Large oven	Comparison
Output (metric tons)	44	135	+94
Workmen:			
Loading	12	13	+1
Looking after "fire"	1	1	0
Unloading	14	16	+2
Coke formation time	144	144	0
Coke formation ratio	65%	66%	+1%
Comparison of oven construction cost (three small ovens equivalent to one large oven)	7200 Yuan	5400 Yuan	-1,800 Yuan
Workers for putting brick on top	12	15	+3



### III. IMPROVING OIL RECOVERY IN NATIVE COKING OPERATIONS

[Following is a translation of excerpts of an article by Shih Ming in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 22, 19 November 1958, page 18.]

During the last few years, our plant has extracted large quantities of coal tar oil in the process of making coke by native methods. In order to increase oil recovery, we have adopted many techniques such as converting oil extraction by the natural draft method to the mechanically forced draft method. Although 3-4 air suction machines have been used and technical supervision has been strengthened, oil recovery is still not high, the quantity being about 22 kilograms per ton of coke.

In August 1958 our plant's staff and workmen, under the guidance of the party, made modifications in the original flowsheet and established a pilot oven to improve oil recovery. As a consequence, without disturbing coke output and quality, we were able to increase oil recovery per ton of coke to 38.17 kilograms.

In order to examine the problems of increasing oil recovery, we first made two preliminary tests. In the second experiment, we tried to maintain standard production conditions and the result was that oil recovery approximated previous levels (oil recovery was 21.3 kilograms). Prior to the third experiment, we carefully studied the results of the first two experiments and made necessary adjustments. Thus, oil recovery was raised to 38.95 kilograms.

Modified operational techniques are described below.

#### IV. CHUNG-CHAN COAL MINE PEOPLE'S COMMUNE TRIES OUT THE SUPPLY SYSTEM

[Following is a translation of excerpts of an article by the Chiao-tso City Commission in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 22, 19 November 1958, pages 29-31.]

The Chung-chan Coal Mine, under the reflection of the Party's socialist construction general line and the greater understanding of the staff and workmen in Communist thinking, has made great progress in raising production. In mid-September, the Chung-chan Coal Mine People's Commune eliminated the wage system and started to try out the "supply system." A systematic communist education movement was started. As a result, commune members went through great changes in thought, in production, and in daily livelihood which led to notable results.

1. During the process of carrying out the "supply system", which was influenced by better understanding of communism, the "leap forward" of the country, and the appearance of "bright star" units in production, "advanced" workers increased and "laggard" workers decreased. The "advanced" workers did not want awards for more work, did not discuss terms for their endeavor, and did not stop when quotas were met. With this fighting spirit, various kinds of difficulties were overcome. For example, the main haulageway maintenance crew under the supervision of Li Yao-tung spearheaded the elimination of the piece work wage system and substitution of the "supply system"; their slogan is "not for oneself, not for money, only for the benefit of communism." After a crew erected 224 sets of cement props, it achieved the remarkable record on the 15th of producing more than 1,000 metric tons of coal in one heading; the "7-1" youth coal production crew of 53 persons produced 1,422 tons of coal on the 18th and attained an overall productivity of 26.83 tons per man-day; the "8-1" youth transport and maintenance crew of 12 men by advancing as much as 25 meters per day in haulageway work around the bottom of the south shaft did ten days work in two days; Liu Shih-teh cut 62 meters with a combine (cutter-leader) in one shift. Many "laggard" workers became "advanced"; for example, of 67 persons in basic construction work formerly considered as inefficient, 32 were converted to the category of "advanced."

2. The implementation of the "supply system" not only increases "profits" for the country and enables more rapid expansion of output, but also assures a steady rise in living standards while cutting down differences. The coal mine, satellite plant, and financial and commerce departments together furnished 3,803,467 Yuan of profits in the third quarter, which was 36.29% greater than the previous quarter. The satellite plant raised its share of the profits from 6,000 Yuan (in the second quarter) to 240,000 Yuan (in the third quarter). The "public accumulation" was 186,000 Yuan per month (sic). The living standards of

commune members have also generally improved. According to data for 132 men of the "transport-maintenance" and the "extraction-development" crews, 8 men in the No. 8 grade level got on an average 2.53 Yuan more per person, 24 men in the No. 6 grade level 8.5 Yuan more, 22 men in the No. 4 grade level 15.81 Yuan more, and 12 men in the No. 3 grade level 12.8 Yuan more. The commune members are very satisfied with the "supply system."

3. Carrying out the "supply system" has meant a military type of organization, warlike way of production, centralized living, better organization, discipline, and attendance, and therefore better utilization of time and labor and increased productivity. The civilian soldiers of the commune, totaling more than 8,000 men and with miners as the core, were organized along military lines in corps, regiments, platoons etc. The various units were organized according to original arrangements; regions and shifts for plants and mines and crews and groups for farms. As a result of better discipline, attendance was greatly improved. Take the east shaft for example: past attendance was about 89.48%; now it is 92.02%; the attendance of farmers was raised from 70-80% to 100%. Output in the first half of October was 3.06% greater than in the first half of September. To solve the labor shortage, we transferred 300-odd road and "production" workers to coal mining, iron smelting, and satellite plant units. The "supply system" has further consolidated group living. We have better dining facilities and are doing better work in taking care of children. We increased the number of dining rooms from 41 to 43 and have divided them in three categories according to the type of workers and the extent of manual labor. We expanded nurseries to 24 and kindergartens to 5, and established a welfare unit and a women's hospital. We improved nursery and kindergarten facilities so that children are well taken care of and parents can work in peace.

## V. COAL DISPLAY BUILDING AT THE NATIONAL EXHIBITION ON INDUSTRY AND TRANSPORT

[Following are translations of photograph captions and accompanying text from an unsigned article in the Chinese-language periodical Mei-t'ian Kung-yeh (Coal Industry), Peiping, No. 22, 13 October 1959, pages 14a-14d.]

1. The main hall of the Coal Display Building, which clearly shows the "Leap forward" in production.
2. This is a model of the modernized Hai-chou opencut mine, constructed with the help of the Soviet Union.
3. Highly mechanized mine shafts designed and constructed by ourselves.
4. Leap forward and again leap forward, one year exceeds 5 years--In 1958 the Second Five-Year Plan (1962) target achieved ahead of schedule; in 1959 a greater increase in production than the total increase for the First Five-Year Plan period.
5. The magnitude of basic construction in coal mining -- in 1958 the designed capacity of new mine shafts completed and brought into production reached 26,550,000 metric tons, which was close to 80% of the designed capacity for the First Five-Year Plan period.
6. The principal direction of technical revolution in our country's coal industry-hydraulic coal mining.
7. The audience enthusiastically views a model of the highly mechanized Han-tan coal washing plant designed and built by ourselves.
8. Advanced shaft sinking method--"vibrating" shaft sinking method.
9. Parallel operations in the "combination coal extraction--sand filling method," developed by the Liao-yuan Fu-kuo coal mine during the "Leap forward" year of 1958.
10. Introducing a model of a new coal mining method for steeply inclined thick coal -- the covered support method.
11. "Coal is a treasure house" exhibition--introducing the various uses of coal.

The hydraulic coal mining exhibition has been a subject of great interest in the coal display building. A model of our country's first hydraulic coal mine shaft--Kailan T'ang-chia-chuang Coal mine--is being displayed. The whole operation involving coal extraction, transport, and hoisting (in this case pumping) is entirely by hydraulic methods. Output of this operation has been increased from 60,000 tons in 1957 to 1,480,000 tons in 1958; estimated output for 1959 is 7,500,000 tons. The rapid progress in hydraulic mining has opened a new leaf in the historic development of the Chinese coal industry. Everyone knows that water is a great obstacle in coal mining. In the past many coal mines were flooded and much valuable coal has been lost. In new China, however, under the leadership of the Party water is being used to mine

coal instead. We are proud of the great advance in coal technology along this field.

In the field of coal washing, a model of the Han-tan Coal Washing Plant--a large scale coal washing plant designed and constructed by ourselves and soon to be brought into production--and a model of a medium scale coal washing plant, which can be constructed quickly at low cost, are displayed. Following the rapid development of the iron and steel industry, production of cleaned coal along with the construction of coal washing plants have also made notable progress. The index for coal cleaning capacity has been raised from 100 in 1949 to 566 at the end of 1958. To meet the needs of the iron and steel industry, newly constructed capacity (including the capacity of simple washing plants) in 1959 is expected to reach 70,000,000 metric tons of coal (probably means mine-run or crude coal) per year.

## VI. GREAT LEAP FORWARD ON THE COAL PRODUCTION FRONT

[Following is a translation of excerpts of an article by the Office of the Leap Forward, Production Bureau, Ministry of Coal Industry, in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 4-5.]

On the foundation of the "Great leap forward" of 1958, the coal industry achieved even better results in 1959. Not only has mine-run production been rapidly increased over and beyond target, but the coal washing quotas for modern coal cleaning plants have also been exceeded. Progress has been made along all fronts--coal extraction, development, stripping of overburden, and maintenance and repair, etc.--on a scale unparalleled in the history of coal mining in China. This victory is great and much valuable experience has been accumulated.

In this year the coal mine workers became deeply involved in a "mass-type, wide-area, high-production, Red Flag contest movement." The results have been glorious. For the working places in the country's key coal mines during January-September, the monthly output averaged 6,795 metric tons, or 13.68% greater than the average monthly output of 5,977 tons in the same period of last year. During September, the working places which attained the monthly output in excess of 10,000 metric tons numbered 452, or more than two times greater than the number during September of last year. Seven provinces attained the "10,000-ton level"; five of these--Hopeh, Honan, Liaoning, Anhwei, and Shansi showed an average monthly output per working place of more than 10,000 tons. Heilungkiang and Shantung Provinces showed an average monthly output per working place in excess of 7,000 tons (low seam coal comparative standards). The Mining Administrations achieving the 10,000-ton level totaled 21, including Kailan, Fushun, Chiao-tso, Hant'an, and Ho-pi; individual mines achieving the 10,000-ton level totaled 102, including Kailan's T'ang-chia-chuang Mine, Huai-nan's Hua-chia-kang Mine, and Chiao-tso's Li-feng Mine. These 10,000-ton provinces, administrations, and mines have a total of 1,075 such working places. The appearance of so many high-production working places had a deciding effect in surpassing the national target ahead of schedule. Results during the last year show that the "Red flag" contest is an effective method of raising coal production and that the Party's policy of promoting the mass movement in modern enterprises is entirely correct.

In pushing the mass movement, technical improvements and technical innovations have also entered a new stage. The 18 major items of "advanced" experience suggested by the Ministry of Coal Industry during the "March Fourth-Grade Cadre Conference" have been widely applied and greatly improved upon during the last year; 18 items have now been raised to 112, including 52 items for large scale coal mines and 60 for local small coal mines. Coal mining technology has assumed a new air. The

work in hydraulic mining has been particularly outstanding. The "four technological barriers" in hydraulic coal mining (dropping, transport, raising, and dewatering of coal) have been successfully overcome at the Kailan, Hsuehchow, Feng-geng, and other administrations so that operations have become normal, systematic, and rational. Coal mined by the hydraulic method in 1959 is expected to be about 3.5 times greater than in the "Leap forward" year of 1958. There are now 63 hydraulic mining areas in the country; each of these areas or working places produces on an average about 95% more per day than "dry extraction" working places. Twelve hydraulic mine shafts have been constructed. Advantages in hydraulic mining include high production, high productivity, low cost, low timber consumption, and better safety. Milli-second detonator blasting at the Fushun Coal Mines cut down firing time by 50-70%, raised production by 12%, and increased productivity by 11%. The electric conveyor safe operation experience introduced by Comrade Sung Shao-hsien at the Kailan Coal Mines basically eliminated stoppage or more than 30 minutes in conveyor incidents and resulted in total average monthly stoppage of less than 100 minutes. Comrade Chang Wen-t'ung developed and learned 8 items of experience on removing pillars and dropping the roof to raise timber recovery rate to about 90%. Comrade Wang Feng-yuan developed systems to transfer heavy conveyors in 1-2 hours and No. 11 electric conveyors in 35-60 minutes. The Chiao-ho Coal Mine "Iron and Steel coal extraction team" transferred heavy conveyors for a 100-meter working face in 70 minutes. The combine (cutter-loader) and coal cutting machine working places at the Yang-ch'uan, Kailan, Hsueh-chou and other Administrations in employing the "one firing one cut or two firing one cut" experience raised production at the working places by 50-75%. The Chiao-tso, Ta-t'ung and other Administrations used the "blast-breakage method of loading coal" in drilling, blasting, and coal cutter working places and attained the "blast-breakage loading coal rate of 30-50%." The Chuan-hung-sheng Mine Development Team at the Hsueh-chou Administration adopted the 3-4 meter length longhole blasting method for rapid mine development. The Chang Wan-fu crew in the Ta-t'ung Administration employed the "shallow hole multicycle rapid excavation experience." The Ch'i Ho-chih small crew of the Ho-pi Administration achieved the new record of 1,193-meter monthly advance and productivity of 1.02 meter per shift in longhole blasting of coal haulageways. The Liu Chiu-hsueh coal mining team of the Chiao-tso Administration maintained 10 years of continuous safe production. These valuable advanced experiences have an important effect on fulfilling production targets ahead of schedule.



## VII. COAL DISTRIBUTION AND TRANSPORT WORK IN THE GREAT LEAP FORWARD

[Following is a translation of an article by the Coal Distribution Bureau, Ministry of Coal Industry, in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 6 and 11.]

Under the glorious reflection of the general line, our country's coal industry has made rapid progress in development and the target for 1959 has been successfully fulfilled.

Following the rapid advance in industrial and agricultural production, coal requirements in all areas have greatly increased, particularly with regard to special types of coals. Thus, the problem of coal distribution and transport has become more urgent. Through good leadership, the coal distribution and transport objectives have been successfully achieved for 1959. As of the end of October 1959, the quantity of coal shipped by railways had already exceeded the total for 1958 by 14%. The "continued leap forward" coal demand for 1959 will be satisfied as far as distribution and transport are concerned.

Good political leadership and the success of the mass movement have had an important effect on fulfilling the 1959 targets in coal distribution and transport. Many coal producing provinces in the cooperative spirit of communism shipped good coal to other provinces to help key construction projects, in addition to meeting their own industrial needs. Much savings and substitution in coal consumption were brought about through pushing the mass movement and introducing technical innovations. For example, the city of Wu-hsi in Kiangsu Province, in substituting anthracite for bituminous coal, in using poor quality coal in place of good coal, and in pushing the integrated utilization of coal, has overcome many difficulties related to product type and made great savings in coal for the country.

In line with the general improvement in industrial management systems in our country, changes have also been made in the coal distribution system. The combination method of centralized distribution and local assignment has been adopted. Coal distribution has become more rational through centralized direction.

In rapidly transporting coal to the consuming units, not only are the coal needs of these units assured but coal production can also maintain continuity. Coal transportation has been very successful because of the mass movement and good cooperation between mines and railways.

### Transport

I. Good cooperation between mines and railways, tonnage of coal transported rising every month.



Results have proven that the communist way of cooperation, in this case between railroads and mines, is very effective in raising the volume of transport. The Fu-hsin mine and railroad doubled their combined transport capacity. The coal cars loaded in March (1959) was nearly twice the number loaded in the peak month of 1958; a "complete cycle operation" takes only about 5.8 hours, or "more than a half less" than the average time needed during January-October 1958; the proportion of "direct destination" trains has also been increased markedly. The tonnage of coal transported has risen each month, the average number of cars loaded during January-September this year being 22.3% greater than the number loaded in the corresponding period of 1958; in addition, 900,000 metric tons of stockpiled coal were rushed out. The experience of Fu-hsin proves again that "railways and mines are one family" is a good way to assure the supply of coal. Since the April "on the spot" conference called at Fu-hsin jointly by the Ministry of Coal Industry and the Ministry of Railroads, the railways and coal mines all over the country have been working together and competing in a "high quality, high production, much transport, and fast transport Red Flag Contest." By introducing the Fuhsin experience to all coal mines and railroads, coal production and transport tonnage have achieved a simultaneous "leap forward." In 1959, not only has the mine-run coal production target been more than fulfilled (and coal quality greatly improved) but transport objectives have also been achieved. According to statistics on the coal loading stations for 19 major coal mines, the "complete cycle operation time" for the second quarter was 0.61 hours less than that for the first quarter and the "complete cycle operation time" for the third quarter was 0.22 hours less than that for the second quarter. For the country as a whole, the net weight of coal loaded per car has also been rising each quarter--a 0.7 metric ton increase between the second and first quarters and another 0.7 ton increase between the third and second quarters. Without increasing the number of cars, the tonnage of coal transported in the third quarter was 2,730,000 metric tons greater. The proportion of "direct destination" trains has risen from 31.5% in the first quarter to 42.4% in the third quarter, which approximately means the saving in coal transport of 21,400 loaded cars. Although such notable results have been achieved in coal transport, there is still much latent capacity that can be developed. In 1960, we must further push the experience of the "Fu-hsin railroad-mine cooperation" in attaining a further great "leap forward" in coal transport.

II. With regard to loading of cars, push technical improvement and "technical revolution".

During the last year, the efficiency of loading coal into cars has been notably increased as a result of carrying out the "two-legged policy" and pushing technical improvement and technical revolution. For example, the staff and workmen of the Shansi

Province Hsi-shan Mining Administration overcame superstitions and developed the "centrifugal type covered car coal loading machine" to raise loading efficiency by 32 times. The manufacture of this equipment is simple and requires little material; therefore, we are pushing its use in various parts of the country.

During the "good quality, high production, rapid loading, and rapid transport Red Flag Contests" the staff and workmen of the coal mines thought of every means to develop coal loading equipment, such as simple coal storage bins, high loading platforms, and low cargo position. With regard to simple coal storage bins, 101 units with a combined capacity of 300,000 metric tons have already been completed as of the end of November 1959 and 130 additional units are being built; we estimate that by the end of the year some major coal mines will have a storage capacity capable of holding three days supply of coal. In this manner, not only will loading efficiency be raised and loading time reduced but normal production of coal will also be assured.

### III. Pushing the mass type of short haul for coal transport.

Some small mines and quickly built large mine shafts, as a result of too rapid development, or for lack of transport materials, have not been able to complete surface tracks. To assure continuity of production and meeting the country's coal needs, shipment of coal from these mine shafts to points of loading or nearby markets becomes a very important job. Ever since the central government issued the directive for developing the mass type of short haul transport, various coal mines have been putting the directive into effect and achieved notable results. For example, the "movable railroad" method was employed in Heilungkiang Province; 27 kilometers of regular railroad track and 30 kilometers of light track were (temporarily) installed at the coal mines so as to bring out 16,000 metric tons of coal per day from mine shafts formerly without rail connection. The Tzu-po Mining Administration built many "native type of railroads" to ship out 15,000 metric tons of coal per day from "sputnik" (quickly built) mine shafts and basically solved the problem of coal accumulation. Results have proven that "pushing short haul transport" is a good method to promote production and assure the meeting of demand.

1959 is a great "leap forward" year in coal distribution and transport. To do even better in 1960, we must strictly follow central direction and carry out the policy of "the whole country one chess game"; we must also dig more coal, understand the problem of demand, and do well the work of coal distribution, particularly with regard to coking coal and lump coal. In coal transport, push communist cooperation and the mass movement; in coal loading equipment, utilize "native-modern" combination methods, push simple coal storage bins, and further increase coal loading efficiency. To

meet the greater coal demand of the further "leap forward", we must achieve the objective of "using better transport to assure high production, ship all that is produced, and transport coal as it is produced."

## VIII. RAISE HIGH THE RED FLAG OF RAPID MINE SHAFT CONSTRUCTION

[Following is a translation of excerpts of an article by the Bureau of Basic Construction, Ministry of Coal Industry, in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 7-8.]

The basic characteristics of the great "Leap forward" in the coal mining industry's basic construction work in 1959 are not only "large scale, good quality, and low cost" but also continuous acceleration of mine shaft and washing plant construction, rapid bringing into production of major enterprises, and early realization of investments. The average time for constructing and bringing into production large, medium, and small mine shafts, has been reduced 30%, 40%, and 40% respectively as compared with the First Five-Year Plan period. We have achieved the standard suggested by the Ministry of Coal Industry of "large, medium, small; three, two, one" (construction of large shafts in three years, medium shafts in two years and small shafts in one year).

Of the mine shafts turned over for production this year, 48% achieved the standard mentioned above. Included in the mine shafts completed are the Hsueh-ch'un large vertical shaft of the Feng-feng Mining Administration with 900,000-metric ton designed capacity--completed and brought into production in 16½ months, the No. 1 vertical shaft of the P'ing-ting-shan Mine with 1,500,000-ton designed capacity--completed and brought into production in 24 months, and the Chi-t'ai No. 4 pit of Pei-p'iao Administration with 210,000-ton designed capacity--completed and brought into production in 10 months. Compared with mine shafts of similar capacities completed during the First Five-Year Plan period--Tung-shan, Hsing-an-t'ai, and Hsin-ch'iu--the construction times were reduced respectively by 63%, 50%, and 52%. With regard to the construction of coal washing plants, the simple washing plants built and brought into production this year generally required 6-8 months to complete, some requiring only three months to bring into production. The five large coal washing plants brought into production this year have been constructed in reduced time (quicker than schedule). For example, the 2,000,000-ton mine-run coal Ma-t'ou Coal Washing Plant of the Feng-feng Administration took 24 months to complete and turn over to production; the time required to construct this plant is three months shorter than the 1,500,000-ton Hsuang-ya Coal Washing Plant turned over to production in 1958.

The accelerated construction of mine shafts and coal washing plants and bringing into production of many mines and plants are good material foundations for the continued Leap forward of our country's coal production.

The rapid construction of coal mine shafts and washing plants during 1959 is first of all a victory for the general line. The workmen and staff, under the leadership of the Party, have overcome many difficulties in accelerating construction; as a result, the mine shaft capacity turned over to production during the third quarter was 260% more than in the second quarter and that in October was 69% greater than the average for the third quarter.

The "Red flag" contest movement has had an important effect on the acceleration of construction. Since March of this year, the workmen enthusiastically carried out the Ministry's slogan of "3, 4, 8, 25" (monthly advance of 30 meters for vertical shafts, 40 meters for inclined shafts, 80 meters for "rock base", and 250 meters for "coal base"). Work was accelerated through "learning from the advanced, comparing with the advanced, catching up with the advanced, and helping those behind." For the country as a whole the average monthly advance for vertical shafts was 23.0 meters in July, 27 meters in August, and 27.9 meters for September; and for "half-coal" tunnels (or haulageways), it was 63.9 meters in July, 86 meters in August, and 119 meters in September. The acceleration of individual projects effectively reduces the overall construction time. For example, after the P'ing-ting-shan No. 7 Shaft of 900,000-ton capacity was completed in 20 months, the workmen of the Feng-feng Administration in trying to beat the record of P'ing-ting-shan built the Hsueh-ch'un vertical shaft of similar capacity in 16.5 months. With regard to construction of coal washing plants, there has also been similar enthusiasm in surpassing other units in construction time; for example, the main plant building for the Lu-chia-tsai 301 B-type plant was built in 14 days and Kailan built two main plant buildings of the 601 type in 17 days.

## IX. COAL FIELD GEOLOGICAL EXPLORATION WORK IN 1959

[Following is a translation of excerpts of an article by Ch'ang P'ei-shih, Chief, Bureau of Geological Exploration, Ministry of Coal Industry, in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 8-10.]

The staff and workmen in coal field geological exploration work, under the leadership of the Party and in line with the policy of "walking on two legs" and the policy of "placing general exploration in an important position, emphasizing delineation of reserves, and stressing coking coal", have developed since the beginning of 1959 a "Red flag" contest movement based upon "high production, good quality, low consumption, safe and wide-area yield." A technical improvement and technical revolution movement has been simultaneously underway. Much progress was achieved in January-November, and the slogan of fulfilling the year's target for "refined and general exploration of reserves" 15 days ahead of schedule was created. It is believed that the year's quota for drilling will be fulfilled by 108.8%. During the first 11 months of this year, the "1,000 meter or above advance per month standard" was achieved by 206 units of drilling equipment-times (one drill can theoretically achieve 11 times this standard), an increase of 32.9% over that for the similar period last year. Much was also accomplished in geophysical exploration, geological surveying, topographical surveying, coal quality analyses, and scientific research. On the foundation of preliminary investigations of coal fields in 1958, some provinces and districts have subsequently prepared 1/200,000 to 1/500,000 scale maps on preliminary surveys of coal fields, coal quality distribution, and "coal field hydrological-geological type." In the field of general exploration for coal, we have drawn many important conclusions from experience. In "half-covered regions", we utilized the "follow the outcrop and strike" method and the "search for overlying and underlying rock" (adjacent to the coal seams) method to find coal. In "fully-covered regions", we employed 13 methods to find coal, including the standard method of doing further exploration based upon known geological structures and the "coal seam sediments" method. We also organized technicians to study special methods of exploring coal fields in Chiang-nan (south of the Yangtze, where coal occurrence conditions are different).

The glorious accomplishments in coal field geological exploration work during 1959 further proves the wisdom of the general line. These accomplishments have stabilized the thought and material foundations for a further great "Leap forward" in 1960.

## X. SUCCESS OF THE GENERAL LINE AND THE MASS MOVEMENT

[Following is a translation of excerpts of an article by Liu Hui, Party Secretary, Kailan Mines, in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 11-12.]

A great "Leap forward" took place in 1959. The mine-run coal target was achieved 17 days ahead of schedule and actual output in 1959 is expected to be 26.5% greater than that in 1958. The coal washing target was also fulfilled 19 days ahead of schedule; by year's end an additional 175,000 metric tons of washed or cleaned coal above the target figure are expected to be produced. The basic construction target was fulfilled 22 days ahead of schedule, and the geological exploration target was fulfilled more than 2 months ahead of schedule. Mine development work was 27.5 days ahead of schedule and, by year's end, it is expected that more than 5 months supply of coal will have been prepared for extraction. Overall productivity was raised 6.57% over that in 1958, unit crude coal production cost was reduced 8.44%, and timber consumption was reduced 1.19 cubic meters per thousand ton coal output. Ash content of cleaned coal has met prescribed standards, and ash content of mine-run coal is close to prescribed standards. Much has also been achieved in research and experimentation--the No. II type of pump has overcome technical barriers, the 200-meter and 400-meter lift pumps have been successfully made on a trial basis, and investigations have been made in finding water accumulations in old underground workings by "surface electrical methods."

The mass movement has been very effective. The workers in striving for higher output and more efficient techniques have carried a revolution in "production organization." At present the working places in the mining region that have adopted the "4-8" overlapping operations represent 70% of total working places. This system greatly increased production and productivity while cutting the underground workmen's working time by 1-1.5 hours. An extreme case is the T'ang-chia-chuang Mine No. 4010 working place where the "4-8" system enabled production to be raised by 80% and productivity by 74.16%. A mass type contest in making technical improvement got under way in all mines. The following experiences were all put to wide use: Sung Shao-hsien's "safe turning of electric conveyor", Chang Wen's "advanced prop-retrieving method," Wang Feng-yuan's "rapid transfer of conveyors," Wang Yu's "blasting method," K'ang Lien-hsi's "rapid excavation method", Li Pai-t'ang's "extraction support method", and advanced experiences in hydraulic mining and excavating rock shafts. The general technical level of workmen has

been greatly raised. For the Kailan Mines as a whole, 667 workers have already attained or surpassed the record established by Li Pai-t'ang. At the Chao-ke-chuang, Lin-hsi, and T'ang-chia-chuang mines, of the 176 "conveyor transferring workmen" who learned from the experience of Wang Feng-yuan, 113 have caught up with his standards. At the T'ang-chia-chuang No. 1092 working place, the transfer of 40 meters of No. 11 type conveyors took only 28 minutes, bettering Wang Feng-yuan small crew's record of 70 meters of conveyors in 50 minutes; the No. 1092 working place used only 3 minutes to move the machine head by an electric motor. A mass type of technical innovation and technical revolution movement is developing in full force.



## XI. LEAP FORWARD AT THE FU-HSIN MINING ADMINISTRATION

[Following is a translation of excerpts of an article by Hsu Chai-lin, General Manager, Fu-hsin Mining Administration in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 15-17.]

Coal production has continued to "leap forward" at the Fu-hsin coal mines, output for the Administration having increased (in 1959) 34% over the tonnage for 1958. The increase has been brought about through carrying out the following aspects of work, which are in line with the Party's general line.

The first point is that we have carried out the policy of "wide-area high production" and have raised the unit working place output. Notable increases took place at the Fu-hsin coal mines since March when the Ministry of Coal Industry started the "wide-area high production Red Flag contest movement." The monthly output for unit underground working places in 1959 was 10% greater than that in 1958, and the efficiency of electric shovels for opencut coal operations in 1959 was 5% greater than that in 1958. These developments stabilized the continued rise of the Administration's total output and assured improvements in all economic indices.

The second point relates to mine-shaft construction in terms of creating new capacity and rapidly increasing the production levels of new mine-shafts turned over for production. All of the seven pairs of mine-shafts (design capacities ranging from 90,000 to 210,000 tons per year, and construction time estimated to be 7-15 months) scheduled to be turned over for production in 1959 were completed on or ahead of schedule. These mine-shafts already produced 230,000 metric tons of coal this year (1959). At the same time, the output levels of mine-shafts turned over for production in 1958 have been steadily raised. For example, the newly constructed Hsin-ch'iu Chin-chia-wa-tzu opencut mine, which took only a year to build and was turned over to production in December 1958, produced 876,000 metric tons of mine-run coal in 1959 or 3.5 times the designed capacity. The Hsin-ch'iu vertical shaft, designed for 600,000 tons and brought into production in September of 1958, produced 474,000 tons in 1959 or 79% of the designed capacity. These two newly constructed units provided 29% of the overall 1959 increase of output for the Administration.

The next point concerns the implementation of the "modern-native combination" policy. During the "Red flag" contest movement, while raising the output of mine-shafts and large opencut operations in terms of unit working places, we also did much small-scale work to fit local conditions such as small shafts, small opencut operations, working with manpower in large opencut mines where the electric shovel cannot be applied (for example, some thin coal seams and "triangular" coal), and recovery of coal from bone and rock piles. During 1959, a total of 2,070,000 metric tons of coal were produced from opencut and mine shaft pickings, satellite shafts and satellite opencut mines, which corresponded to 18.7% of the Administration's increase in production during 1959. Thus, it is clearly proven that the "native-modern combination method" is very effective.

Finally, the policy of "one hand seize production and one hand seize livelihood" was carried out. While promoting production and construction, much work was also done in producing by-product food. In the last year, the coal mines produced 17,970,000 chin of vegetables or 300 chin per person for the mine's entire staff and workmen, 2,665 head of hogs or 11 chin per person, and 515,000 fish; in addition, many cattle, goats and sheep, chicken, ducks, and rabbits, etc. were raised (above figures do not include the food products raised by staff and workmen themselves on their own time). Improving the means of livelihood of the staff and workmen has had an important effect on the overall "Leap forward."

## XII. SHANSI PROVINCE LOCAL MINES DURING THE LEAP FORWARD

[Following is a translation of excerpts of an article by the Shansi Province Coal Mine Bureau in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 24-25.]

The local coal mines in Shansi Province, on November 21, completed the Province's 1959 target 40 days ahead of schedule (100.22% fulfillment of the year's target on that date). The production attained was equivalent to 7.78 times the 1949 output for local mines in Shansi and represented 35.7% of the Province's total 1959 target.

Changing the technical complexion of the small coal mines---in line with the spirit of the directives issued by the Ministry of Coal Industry and Provincial commissions and according to definite programs---we continued the work in constructing modern mine-shafts to strengthen the "skeleton" of local mines and organized the large and medium scale coal bases; at the same time, we centralized "forces" (technical and financial) to make technical improvements on small coal mines owned by the counties. Party members from all areas carefully evaluated all of the small mines in terms of reserves, transport conditions, and iron and steel counterpart facilities and made plans for location, type, personnel, organization, and leadership. Small mines with unfavorable conditions such as inadequate reserves, unsuitable location, and lack of demand were eliminated. The rest, from small to large and from native to modern, were developed according to the policy of "making changes along the whole front and raising the levels of key projects." Plans were made for technical improvement, mass efforts were stressed, materials were obtained locally, and mines were first started by native methods. For small mines with good development conditions, technical changes were gradually made to change the native mines to "have native and half modern" and finally to small modern mines.

In the process of transforming the mines, emphasis was placed on "trial points, model soldiers, and on-the-spot meetings." Examples of practices believed to be worthy of wide application in the Province include the trial work in converting the Po-nan native mine into half native and half modern operations and efforts on mechanization by the Chin-ch'eng small mine (the use of auger drills in coal extraction, camel-pulled drums in shaft hoisting, flat mine cars in underground transport, and native rails in surface transport). In March of this year an on-the-spot conference of small mines in the Province was called at Chin-ch'eng with a view

to making technical improvements. Party groups in various areas thought of every means to overcome supply and equipment shortage difficulties, organized mutual assistance and cooperation, and devised methods to make equipment by native practices. For example, at the Yi-ch'eng Hsin-sheng coal mine, the policy of "building strength from within" was implemented through "going to the hills to chop wood (for timber), turning the stock room (and yard) inside out in search of waste materials, and obtaining iron and hoisting drums from the commune iron plant." In the Southeast Shansi special district, 21 units of steam hoists and 2 units of steam pumps were "self-made" from pig iron. Many improved techniques were developed in various areas. With regard to the item of hoisting alone, six types of systems were developed: the "hump-machine" to turn the native hoisting machine, conversion of the "liberation-type water wheel machine" to a hoist, a "motor-car head" to turn the lifting machine, "the single and double phase hoist," and the hand-turned hoisting machine. After technical improvements were made, the P'ai-nan coal mine raised daily production from 35 to 240 metric tons and productivity from 0.57 ton to 2.24 tons per man-shift.

From January to September this year, 235 small coal mines were modified and streamlined, including 41 which are now operating on a "semi-mechanized" basis. Combined capacity for small mines (in the Province) has been raised from 3,500,000 tons to 7,500,000 tons. The staff and workmen employed in the Province's local mines were 7,932 less than during the first quarter, daily output has been raised from the 44,517 tons in the first quarter to 52,049 tons (or an increase of 16.92%), and overall productivity increased 14.19% over that in the first quarter.

### XIII. ADVANCES MADE IN SMALL COAL MINES IN SHANTUNG PROVINCE

[Following is a translation of excerpts of an article by the Shantung Province Coal Industry Bureau in the Chinese-language periodical Mei-t'an Kung-yeh (Coal Industry), Peiping, No. 30, 30 December 1959, pages 25-26.]

On the foundation of the great "Leap forward" in 1958, the small local coal mines in Shantung Province made a continued "Leap forward" in 1959. The 1959 target was achieved 56 days ahead of schedule, and it is estimated that the year's output will be more than 2.5 times greater than the actual output in 1958.

The small coal mines in Shantung Province were mostly developed during 1958 under the "walking on two legs" policy. According to data for the early part of this year, during the short span of four months last year, the small mine shaft capacity constructed totaled 8,532 metric tons per day. After modification and consolidation in 1959, the November average daily production of small mine shafts has been raised to 16,230 tons. While production has risen greatly, manpower needs are smaller--good proof of the effectiveness of the consolidation program. Small coal mines have been opened up in all of the Province's coal-bearing areas so that coal needs of key industries, particularly iron and steel bases, are adequately met. This great accomplishment has been brought about under the Party's socialist construction general line and "walking on two legs" policy.

Surface transport has been improved; this is necessary to assure continued development of small coal mines. The T'ang-chuang Coal mine in making "level tunnel three-wheeled coal transport vehicles" raised efficiency by more than four times. The Chai-li mine in the Tzu-po special district greatly improved transport efficiency through introducing the hand-turned hoist and "native style endless cable". Coal mines in the Lin-ch'in area laid 47,624 meters of wooden rails to solve the problem of short haul transport.

Management work was strengthened to convert losses into profits--the past state of confusion and deficit spending has been rectified. The Ch'ang-wei special district, through improving labor organization and cutting personnel, overcame loafing in work and greatly raised productivity; cost management work was strengthened through establishing "the three-stage cost calculation system, the estimated expenditure system, the allocation of materials and supplies system, and the exchange of old tools for new ones system; coal quality, transport, and marketing work have also been emphasized so that coal quality is continually raised

and coal is marketed as it is produced. These measures enabled the district to meet targets in both quality and cost. During January-November, the district's bone or waste content in coal was 11.2% less than the specified standards and the unit cost of 11,733 Yuan was 9.12% less than plan. The Chi-ning special district Mu-shih coal mine in pushing the mass movement started to use the "mine, shaft, and shift three-stage calculation system". As a result, production rose greatly and cost declined. Average daily output in September was 577 metric tons or 57.6% greater than that in August; cost in September was 10.64 yuans, or 40% less than that in August; the deficit spending system has been entirely done away with. The Lin-ch'in Chu-chen coal mine has successfully made and installed ceramic supports on a trial basis as a substitute for mine timber; 3,573 units of these supports were made in February-October this year and 2,460 installed so that the timber shortage problem has been entirely solved and, in fact, costs have been greatly reduced.

#### XIV. CHING-HSI MINING ADMINISTRATION USES "FOUR OVERLAPPING EIGHT-HOUR SHIFT SYSTEM THROUGHOUT ITS OPERATIONS

[Following is a translation of an article by Ch'en Yao-te, Ching-hsi Technical Office, in the Chinese-language periodical Mei-k'uang Chi-shu (Coal Mine Technology), Peiping, No 1, 1 January 1960, pages 4-5.]

In line with the Party's general line and the spirit of the "Red flag" contest movement in the country's coal mining industry, the six producing mine shafts of the Ching-hsi Mining Administration starting from October 15 have one after another adopted the "four overlapping 8-hour shift system" (4-8 system). By November 15, the Administration's 62 extraction working places and 128 "excavation advance" (development) working places have all been converted to the "4-8 system." Comparing the second half of November with the month of October, all operational indices showed notable advances: 14.1% increase in overall productivity, 13.59% rise in productivity for producing workmen, 6.51% rise in productivity for extraction mining workers, 6.7% rise in productivity for development workers, 18.05% decline in mine timber consumption, and 7.46% decline in cost.

The organization form of the "4-8 system" employed in our Administration varies with the different mines. Generally speaking, there are two main types: one is the centralized time overlapping type (two starting at twelve o'clock and two starting at six o'clock) and the other is the fluid overlapping type (for each extraction and development section, there is an overlap of two hours). The centralized time overlapping system requires close coordination in hoisting, transport, supply of mine cars, and working face operations. The "fluid" system is more applicable to horizontal tunnels, where workers can come in and out easily so as not to upset schedules in mine car supply. Each of the two overlapping systems has its advantages.

We shall describe below the experiences of the Men-t'ou-kou coal mine, which has had the best success in the "4-8 system."

There are three mining areas in the Men-t'ou-kou coal mine, with 3 vertical shafts, one incline, and four operating levels. The hoisting and transport systems and coal seam structures are relatively complicated. At present 5 gently dipping coal seams and 4 steeply dipping coal seams are worked; changes in the steeply dipping seams are fairly severe in contrast with the even nature of the gently dipping seams. Men-t'ou-kou's 9 extraction working places and 23 "excavation advance" working places have all been converted to the "4-8 system" as of November 12.



## I. Organization and work schedules for extraction-development cycles.

In the centralized overlapping system employed by the mine, the first shift is from 6 a.m. to 2 p.m., the second from noon to 8 p.m., the third from 6 p.m. to 2 a.m., and the fourth from midnight to 8 a.m.

### A. Work schedule graph for extraction cycles

Most of the nine extraction working places in the mine employ the "single longwall coal extraction method" in conjunction with system of "roof control by knife pillar. Coal is produced in all four shifts and one night and day is a cycle. Most of the coal is produced during the "non-overlapping time" and preparation work for the next shift is primarily done during the overlapping hours. In the process of coal extraction, all operations are also overlapping.

Take the example of the No. 16 extraction site. The length of the face is 80 meters; dip of coal seams is 13-25°; support at the face is by timber; within one controlled collapse area there are five rows of capped support and one row of concentrated timber support; rows of support are parallel along the strike, and the dip or grade is 1.5 meters; the coal cutter is used in conjunction with making holes and blasting to drop the coal; each cycle advance is 1.6-1.8 meters; and output per cycle is 507 metric tons. The work schedule for the four shifts is shown in Figure 1. Aside from the fact that the cutting machine is lowered into place during the overlapping time in the third shift, work conditions in all other shifts are similar.

**Overlapping period:** The operators of the coal cutters in the two shifts jointly cut 25 meters of coal; the early shift workers aside from gathering coal (later shift workers help a little in this work), producing 53 cars or 32 metric tons of coal, and pushing and dumping mine cars in the main haulageway are also partly engaged in cleaning up loose coal and transferring conveyors (preparatory work). The later shift workers primarily work on drilling 40 holes, transporting tamping material and blasting power, bringing in 50 pieces of timber, and erecting one line of "concentrated support" (15 props in a 3.8 meter distance down the dip).

**Non-overlapping period:** The coal cutter operator will continue to cut coal if the specified work has not been completed during the overlapping period and this man must also set aside some time for coal cutter inspection and repair; workers originally assigned to transport go back to the main haulageway to load and dump cars; the prop-erecting crew erects support at the working face; most of the remaining workers concentrate on producing more than 158 cars (more than 95 metric tons) of mine-run coal.



Prop retrieving and roof lowering work are handled by a specialized small crew, who do this work during the first or 6 a.m. -2 p.m. shift. In 5 days, the crew retrieves the 5 rows of capped props and one row of concentrated prop supports.

Labor organization and assignment: On the premise of not adding personnel and taking into consideration the technical capability and political circumstances, we have changed the three-shift system to the four-shift system with the workers doing combination types of work. There are 12-13 workers in each shift, including a coal cutter operator, a helper for this operator (during overlapping shift hours, this man helps to transport materials and assemble coal and during non-overlapping hours helps the coal cutter operator), two workers for pushing cars (during overlapping hours they help to transport materials and gather coal, and during non-overlapping hours load cars and dump cars), two workers for erecting props (during overlapping hours they erect "concentrated props" and during non-overlapping hours conventional props at the working face), and a drilling and coal-loading crew of 6-7 persons (during overlapping hours they drill holes, and during non-overlapping hours produce coal). The prop-retrieving special crew consists of 3-4 persons who work only during the first shift each day.

#### B. Work-schedule graph for "development cycles"

In "excavation advance" (development) work-sites, props are generally not needed because the roof is relatively firm. Most of the time, the single-opening system is used. The overlapping operation is carried out in the same location.

Development of coal entries: The usual method is "four-hole, manual loading, and one small shift cycle." For example, the work-site of the No. 11 excavation crew has a cross section of 6 square meters. Three persons in each shift do a mixed type of work (drilling, erecting props, gathering and loading coal, etc.). During non-overlapping hours, two persons drill holes and one person does preparatory work (such as transporting powder, tamping material, etc.); in these hours, all holes are drilled and loaded with powder, the blast (or blasts) set off, and a small part of the coal is produced. During the overlapping hours, workers of both shifts concentrate on producing coal and cleaning up the whole working place. The operating conditions are shown in Figure 2.

Development of rock entries (tunnels): The usual method is "six-hole, manual loading, and one small shift cycle." For example, the work-site of the No. 18 excavation crew has a cross section of 8.7 square meters. There are 8 men to a shift. During the overlapping hours, all 8 men of the early shift load rock, 4 men of the later shift help "produce" rock, load cars, and clean up the rock in the work-site, and the other 4 men of the later shift drill holes.

During the non-overlapping period, 4 men continue to drill holes, and the other four men do auxiliary work or erect props. The operating conditions are shown in Figure 3.

## II. Assignment of transport and hoisting work

To assure smooth operations of the "4-8 system" for the mine as a whole, adequate mine cars are assigned for all mining and excavation work-sites and the shaft and hoist capacities are carefully calculated. Charts on the supply of mine cars, utilization of electric locomotives, and the shaft hoisting conditions are made.

A. Allocation of mine cars is according to a specified transport chart: Transport direction and exchange stations are established underground, with a special person in charge (3 shift system). The person is responsible for supplying mine cars to various mining and development working places and allocating and directing the locomotives. He must know his work well so that not only are mine cars rationally allocated but their turnover rate constantly raised.

B. Centralized use and allocation of electric locomotives: In the past, locomotives were only employed in specific haulageways so that their potential was not fully utilized and their inspection and repair were not done on a regular basis, with the result that the mine car supply was unsteady. After changing to the centralized use and allocation system, efficiency greatly improved (in the past one trip took 11 minutes, and now only seven minutes) and adequate time is assured for inspection and repair of locomotives.

C. Use of signals to manipulate cars: In the past the mine car storage area had no signal system so that their despatch by electric locomotives was often in a state of confusion. Ever since the signal system was introduced, the mine cars needed by the various coal and excavation work-sites could be dispatched according to demand. The signal system is by lights. By supplying what is required, the problems of "idle cars" and "inadequate cars" are minimized.

D. As a result of pushing the "4-8 system", the hoisting frequency and the periods the hoists are in use are increased. Thus, the shaft and hoist inspection and repair time must be more carefully allocated. The necessary inspection time is assured through reducing "auxiliary work" in the shaft.

## III. Establishment and consolidation of several systems

As a result of introducing the "4-8 system" more careful assignment of mechanical and electric equipment, materials and supply, and coordination through better management became necessary

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skips; auxiliary shaft: 6-meter diameter, 214.5 meters deep, equipped with a pair of ordinary 3-ton cages (with facilities to hoist waste rock, personnel, and materials); ventilation shaft: 3.7-meters diameter, 116 meters deep, and equipped with two fans (2.8-meter 2.4-meter, both 800-kilowatt); shaft tunnels totaled 9,000-odd meters, of which 2,500 were arched (with reinforced concrete); total mine shaft excavation volume was 100,000 cubic meters.

"Professional construction in mine shaft area was 11,000 square meters and construction by workmen and villagers was 20,000 square meters; standard railroad construction was 16.2 kilometers and communication lines 23.8 kilometers; about 24,000 metric tons of mechanical and electrical equipment, including 276 non-standard items weighing about 430 tons for 12.4 kilometers of 6 KV electric power cables.

During 1958, work was simultaneously done on 7 pairs of mine shafts and the interior of 12 vertical shafts in the (Feng-feng) Bureau. As a result, a shortage was felt in materials and supplies, construction equipment, manpower, and short-haul transport. In addition, because of change of design in the early part of August, construction of an auxiliary shaft was stopped for more than 4 months. As we entered 1959, the Bureau had to turn over three pairs of large mine shafts, two large scale coal washing plants, and turning over the Hsueh-ch'un mine shaft was fourth on the list of projects in our Bureau. Moreover, 5 shafts under construction entered the stage of horizontal tunnel development so that material supplies, construction equipment, manpower, and transport tools were in short supply. Under these most difficult conditions, as a result of the correct leadership of the Party and the tremendous effort of the staff and workmen, we turned over the Nos. 1 and 2 mine shafts of Yang-chu-ho and the large scale Ma-t'ou coal washing plant on schedule and then concentrated our forces to complete the Hsueh-ch'un modern vertical shaft.

XVI. "4-8" OVERLAPPING OPERATIONS ARE SUSTAINING HIGH SPEED DEVELOPMENT  
OF THE COAL INDUSTRY

[Following is a translation of excerpts of an article by Chao Tzu-shang, Vice Minister, Ministry of Coal Industry, in the Chinese-language periodical Mei-k'uang Chi-shu (Coal Mine Technology), Peipin, No. 3, 1 February 1960, pages 2-7.]

Ever since Minister Chang suggested "4(shift)-8(hour) overlapping operation" ("4-8 system") during October at the second meeting of the "Red flag" contest movement for the coal mines in the country with a view to revolutionalizing organization for production, various provinces, regions, mining administrations, mines, and construction units, under the leadership of Party representatives of provinces, cities, and mines, quickly initiated the system. On the one hand, the advantages of the system were described to the families of the staff and workmen; and on the other hand, the system was tried out, on-the-spot conferences were called, experiences were exchanged, and a plan to push the "4-8 system" was formulated. Thereafter, it was the question of introducing the system to all parts of the country. From the national viewpoint, this movement to revolutionalize organization for production took root quickly because good results could be rapidly achieved. No other single event in the coal industry was so successful. Now, not only has the system been adopted by most of the "directly managed" mines but also by some local mines. The system works in production as well as basic construction, in clean-up mining as well as development, and with almost all kinds of mining methods. In a short period of only two months, the "4-8 system" has already been put to wide use in the country's coal industry front.

The success of the "4-8 system" did not just happen. A good groundwork was laid by the "anti-rightist, work hard, increase production and economize movement." The system not only fits production and construction conditions in the coal industry and meets the needs for rapid development, but is also beneficial to the workers as well as their families. Thus, the system had mass support from the start. Careful preparatory work under the leadership of the Party was also beneficial.

1. Idle time is adequately utilized and equipment put to better use so that production and productivity are greatly raised and costs are reduced. The introduction of the "4-8 system" with parallel overlapping operations to eliminate discontinuity of operations not only raised coal extraction time per day from 12-14 hours to 18-22 hours but also reduced the production cycles. The result is higher production, higher productivity, lower costs,

and better balance in production. The Yang-ch'uan No. 4 mine, after introducing the "4-8" system", realized an increase in average working-place monthly production of 27.31%, an increase in productivity of 7.8%, and a reduction of timber consumption by 31.34%. The Ho-pi Ch'en-chia-chuang mine realized an increase in average working-place monthly advance of 37.4% (monthly advance reached 73.1 meters), an increase in monthly production per working place of 16.7%, an increase in productivity of 9.4%, a reduction of timber consumption by 9.8%, and a reduction of (overall) costs by 11%. After the "4-8 system" was adopted in thin seam operations at the Lung-ch'uan mine of the Tzu-po Mining Administration, the monthly output for the No. 707 working place was raised from 8,863 metric tons to 12,272 tons or an increase of 49%. After the "4-8 system" was adopted at the No. 5 mining area of Fushun Administration's Sheng-li mine, equipment utilization rate was raised 42-50% and, because production became better balanced, accidents related to conveyors and transport were generally reduced, which in turn meant smoother operations.

Lenin once instructed us that "in any socialist revolution, after the proletariat has assumed power....it is necessary to place in the foremost position the basic mission to establish a socialist economic system superior to the capitalist system; this basic mission is to raise labor productivity, therefore, it is necessary to have a 'higher form' of labor organization." Selected Writings of Lenin, Volume 2, page 387). Pushing the "4-8" overlapping operation and realizing a revolution in production organization for the coal industry precisely follows the teachings of Lenin in that labor productivity in coal mining is rapidly raised. In the last two months, labor productivity for most of the units has been generally raised by 10-15%, which adequately proves the great revolutionary significance of the "4-8" overlapping operation.

2. We have achieved leisure with work or work and leisure combined. After carrying out the "4-8" overlapping operation, because of adequate utilization of "working time and idle time," normal cycles were assured so that additional shifts and extended working hours were basically eliminated. In generally reducing the workers' underground time by about an hour and a half, the workers' health conditions were improved. Also, as a result of increasing the number of shifts, "pushing and standing in line" have been basically eliminated. The workers at the Chao-chuang mine say that the "4-8 system" eliminates the two crowded conditions (changing clothes and taking baths) and three lining-up situations (eating, getting lamps, going up and down cages) so that the workers generally have 2-2.5 hours free time to indulge in cultural activities and technical training and have more recreation and better family life." Therefore, since implementing the "4-8 system" the working and health conditions have been improved so that workers are more vigorous,

have a better work attendance record, and participate more in training: the objective of leisure with work and work and leisure combined has been achieved. At the Kailan Chao-ko-chuang mine, the attendance rate for production workers was increased from 94% in October to 95.98%. At the Pei-p'iao San-pao No. 3 Pit, the workers participating in training has been increased from 50% to about 90%. The workers of the Feng-feng No. 5 Mine say that the "'4-8 system' is indeed good, each shift has a chance to sleep regular hours, prior to work one can read newspapers and listen to broadcasts, once in the pit we work very hard, coming out of the pit one can take a bath with clean water, there is no more lining up for lamps and eating." Because the workers can coordinate work and leisure better, their families are also much happier and they support the "4-8 system" equally as much and are very grateful for the concern shown by Chairman Mao.

Socialist enterprises not only assumes the responsibility for production and material wealth, but also the responsibility of "production talent." In this regard, many methods have been tried. However, since carrying out the "4-8 system" which permits more free time, favorable conditions have been developed for the "coal mine cultural technical revolution." Thus, the "4-8 system" is revolutionary in nature with regard to rapidly raising the cultural and technical levels of the workmen.

# FIGURE APPENDIX

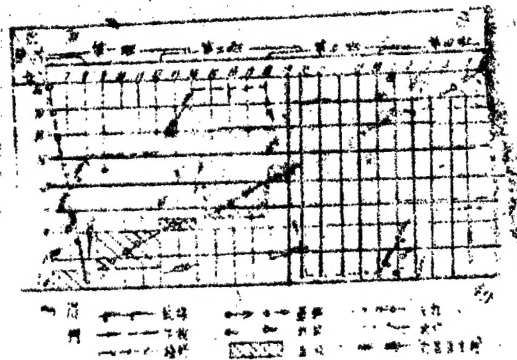


Figure 1. "4-8" Overlapping Operation Cycle Chart for No. 16 extraction site.

From left to right on top, we have the First, Second, Third, and Fourth shifts with number below showing hours (13 means 1 pm, and 19 means 7 pm). Numbers on left from 80 on top to 0 on bottom denote length of working face. Symbols on bottom of chart: left three from top to bottom--coal cutting, lowering of cutting machine into place, and maintenance and repair; middle three from top to bottom--transport of supplies, drilling holes, and extract coal and provide support; and right three symbols from top to bottom--erecting support, blasting, and insert "concentrated support."



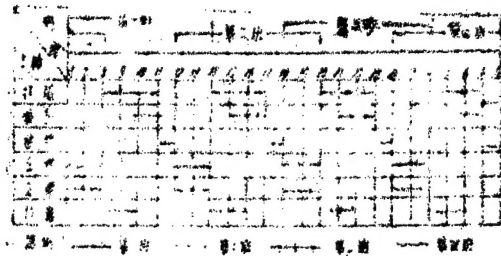


Figure 2. Top part same as Figure 1 (various shifts and hours). The six pairs of words on the left from top to bottom: drilling, loading powder, blasting, producing coal, erecting support, and spiking tracks. Bottom line from left to right: Symbol, First shift, Second shift, Third shift, and Fourth shift. Figure 2 pertains to the No. 11 crew

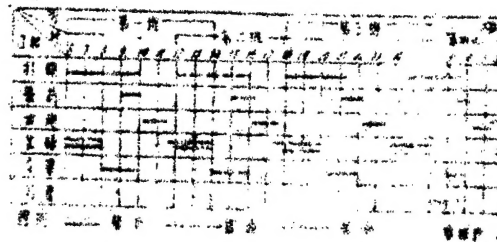


Figure 3. Work cycles for the No. 18 rock development crew. Words in Figure 3 are entirely the same as those of Figure 2, except for title.

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